Project Execution Planning for Building Information Modeling

Progress Meeting #5 – December 5th, 2008

A buildingSMART Alliance project sponsored by:

- The Charles Pankow Foundation
- Construction Industry Institute (CII)
- Penn State Office of Physical Plant (OPP)
- PACE

Conference Call Agenda

1. Introductions
2. Review Project Goal
3. Discuss BIM Execution Plan Contents
4. Discuss Planning Process
5. Future Task Discussion

Team Members

- **Board of Advisory**
  - **Deke Smith** – Executive Director of buildingSMART Alliance (Industry Champion)
  - **Victor Sanvido –** Ph.D., Senior Vice President, Southland Industries
  - **Francois Grobler –** Ph.D., US Army CERL and IAI - North America
  - **Steve Hagan** – Project Knowledge Center, U.S. General Services Administration
  - **Soad Kousheshi –** President, AEC Strategy
  - **Ed Gannon –** Manager of Design Services, Penn State Office of Physical Plant
  - **Mark Falzarano** – Barton Malow Company
  - **Mark Butler** – HDR
  - **Derek Cunz** – Director of Project Development, Mortenson Construction
  - **Mark Konchar-** Vice President – Balfour Beatty Construction
- **CIC Research Program Team Members**
  - **John Messner** – Director of the CIC Research Program
  - **Chimay Anumba** – Professor and Head of Architectural Engineering
  - **Sam Hunter –** Assist. Professor of Psychology
  - **Craig Dubler –** PhD Student, Architectural Engineering (Construction)
  - **Colleen Kasprzak –** MS Student, Architectural Engineering (Operations)
  - **Chitwan Saluja –** MS Student, Architectural Engineering (Planning)
  - **Nevena Zikic –** MS Student, Architectural Engineering (Design)
  - **Shane Goodman –** BAE/MAE Student, Architectural Engineering
- **Sponsor Represenatives**
  - **Bob Tener** – Director, The Charles Pankow Foundation
  - **Steve Thomas** – Director of Research, The Construction Industry Institute

Project Overview

- Identify BIM methods and implementation strategies organized by project phase
  - Planning, Design, Construction, Operations
- Develop implementation guidelines and best practice methods
- Disseminate the results
  - BIM Execution Planning Guide
  - Interactive execution planning computer tool
  - Presentations at national conferences e.g. buildingSMART, AIA, AGC BIMForum, etc.
  - Articles in industry and academic publications

Progress Report

- Continuously developing concept for BIM Execution Planning Process.
- Reviewing additional resources with similar scopes for collaborative efforts and/or additional value to our guide.

- BIM Ex Class
  - Developed BIM uses on wiki through interviews and lit review
  - Wrapping up the case study projects

	Design Communication	System Analysis	Estimation	Scheduling
Plan	▪ Existing Conditions Modeling ▪ Programming	▪ Site Selection	▪ Preliminary Cost Estimation	▪ Phase Planning
Design	▪ Design Authoring ▪ Design Reviews (Constructability, 3D Design Coordination, Virtual Mock-ups)	▪ Site Analysis ▪ Engineering Analysis (Structural, Energy, Lighting , CFD, IAQ Evaluation, Thermal Performance) ▪ Code Validation (Emergency Evacuation, Security Analysis) ▪ LEED Evaluation	▪ Cost Estimation	▪ Phase Planning (Tenant Fit-out)
Construct	▪ 3D MEP Coordination ▪ Digital Fabrication ▪ 3D Control and Planning	▪ 3D System Design	▪ Unit Price Estimating	▪ 4D Planning ▪ Site Utilization Planning
Operate	▪ Record Model ▪ Asset Management ▪ Space Management/ Tracking ▪ Disaster/Emergency Planning	▪ Building Performance Analysis	▪ Maintenance Cost Estimation	▪ Building Maintenance ▪ Renovation Coordination

BIM USE from WIKI

CLICK HERE
(Link to WIKI)

bim plan.design.construct.operate
EXECUTION PLANNING GUIDE

Virtual Mock-ups

Actions
New Page
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Navigation
Home
Scheduled Events
Research Team

Planning Process

BIM Uses
Planning
Design
Construction
Operation

References

Draft BIM Guide
Glossary

Meetings
Interviews
Case Studies

Editing this wiki
List of all pages
edit navigation

Goal: Virtual Mock-ups

Status of Use Document: Early Draft

Phase(s): Design

Objective:
[_] Preview space aesthetics and layout during design review in a virtual environment
[_] Able to evaluate effectiveness of design in meeting building program criteria and owner's needs
[_] Creates efficiencies in design process
[_] Communicate design to client and construction team
[_] Eliminate costly onsite mock-ups
[_] Reduce time needed to construct mock-up
[_] Use virtual mock-up as marketing tool

Description:
Mock-ups are used to convey the design to all parties involved and evaluate criteria that is important for that space, e.g. lighting conditions, safety, security, acoustics, sight lines, aesthetics, ergonomics, etc. Traditionally, mock-ups are full-scale representations of the space constructed out of plywood or full finish materials for a realistic representation of the design. Traditional mock-ups are inherently expensive and time consuming to construct. Virtual mock-ups can replace traditional mock-ups to finalize design issues, minimizing time and money.

Potential Benefits:
[_] Reduce time and money (possibly 1/5 the cost of a traditional mock-up) needed to construct mock-up (1)
[_] Able to model different design alternatives or scenarios
[_] Real-time modification of model during review by project participants
[_] Virtual mock-ups are an effective means of communication among team members
[_] Shorter review time of model by project participants

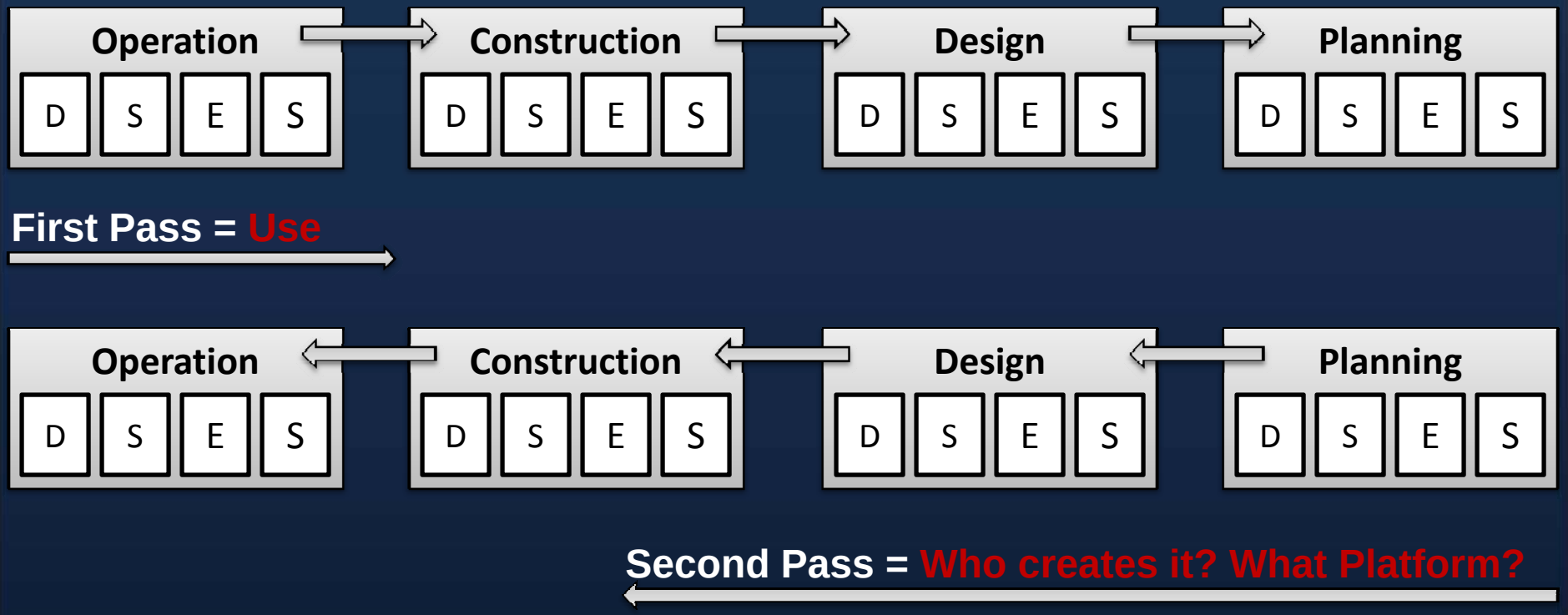
Levels of Detail Considerations:

- Depends on what purpose of mockup is
  - Less detailed for space issues
  - More detailed for finish issues
- Highest possible detail best for construction where you need to view finishes and textures

Team Competencies Required:

- Need training course to teach designers how to model in 3D and use virtual mock-ups
- Should be company wide
- Typically not a generational gap between young and old

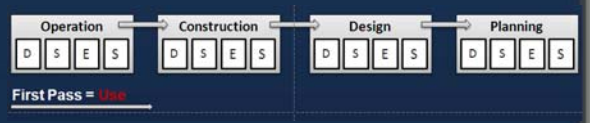
Execution Planning Process Concept: "Begin with the End in Mind"



Execution Planning Process

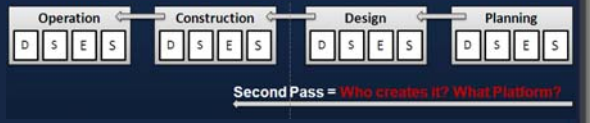
BIM Use Identification

- Manual review of BIM uses
- Decision Support System to proceed from project characteristic to recommended BIM uses



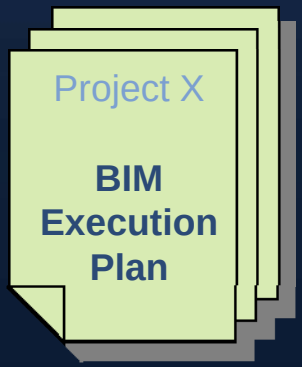
BIM Process Planning

- Develop a process specifically tailored to the project which includes tasks supported by BIM along with information exchanges between processes



BIM Execution Plan Development

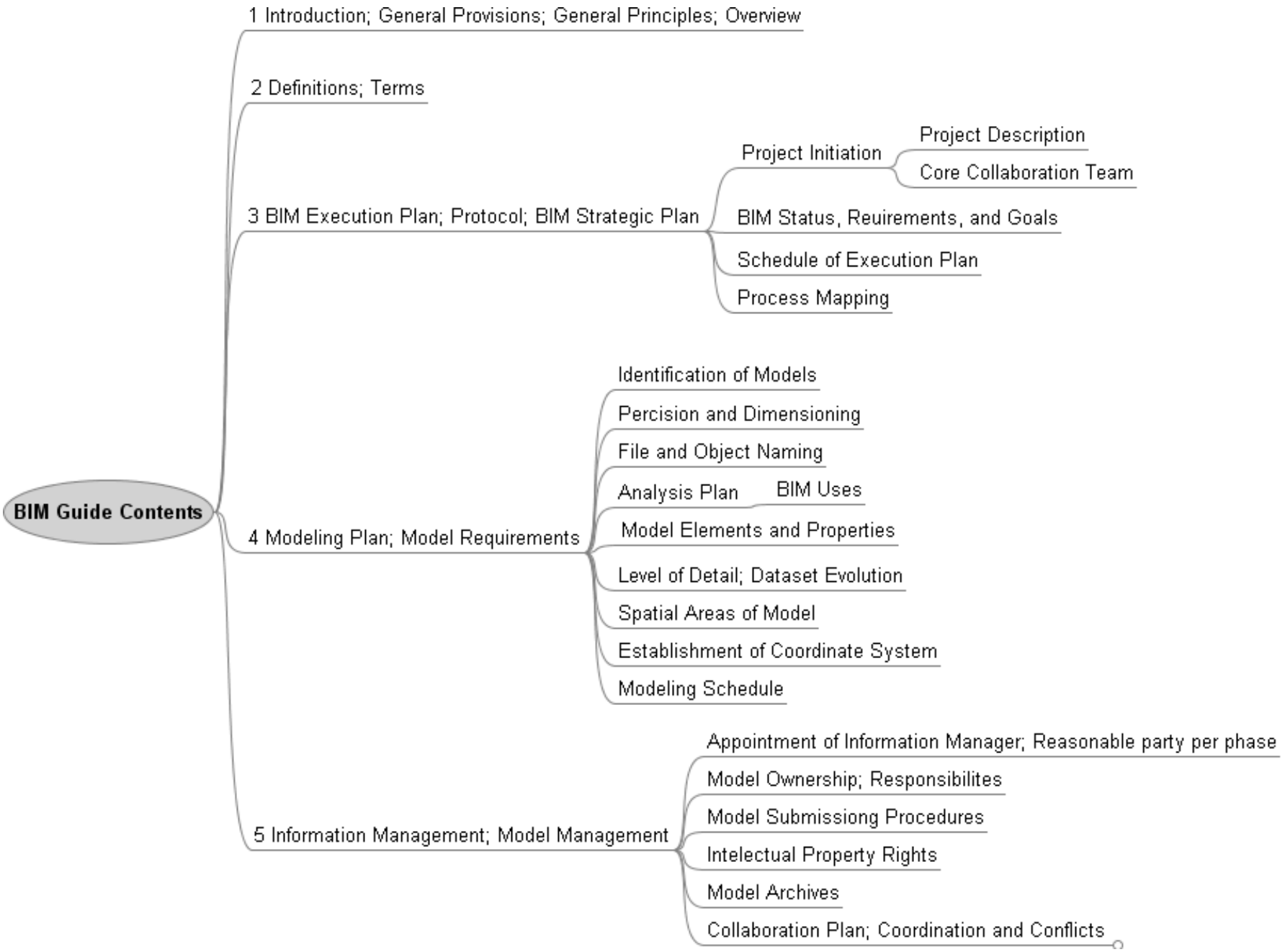
- Development of a detailed plan and procedure for each use and the information flow between the uses



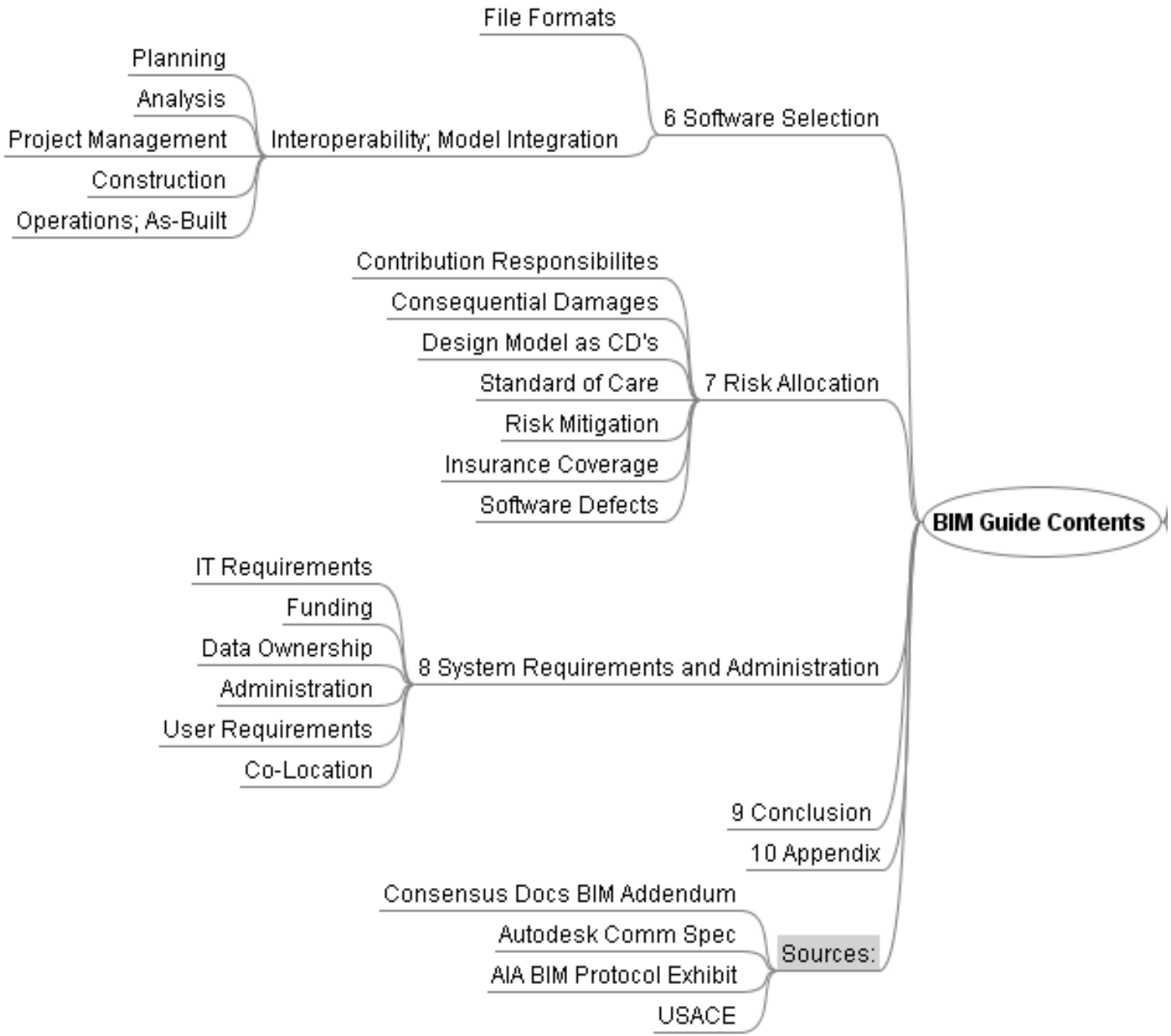
Execution Planning Categories

Project Reference Information	• Critical project overview information, contractual requirements related to BIM, and key project contacts
Project Goals / BIM Objectives	• Document the underlying purpose for BIM implementation on the project and why key BIM use decisions where made
Model Development Process	• Identification of the process for creating, reviewing and modifying the model. Include information exchange requirements.
BIM Scope Definitions	• Include model elements by discipline, level of detail, and specific attributes
Organizational Roles and Responsibilities	• Define the roles of each organization along with responsibilities • Define contracting strategies for organizations
Communication Procedures	• Electronic communication procedures • Meeting communication procedures
Model Quality Control Procedures	• Identify the methods to ensure model accuracy and comprehensiveness

BIM Execution Plan Contents

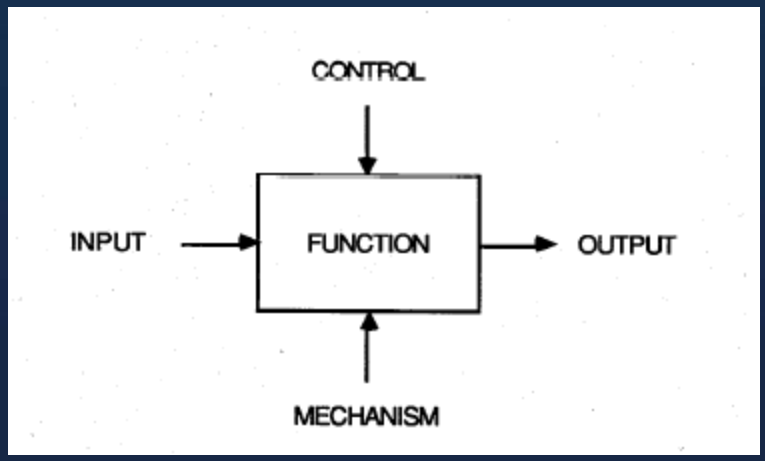


BIM Execution Plan Contents



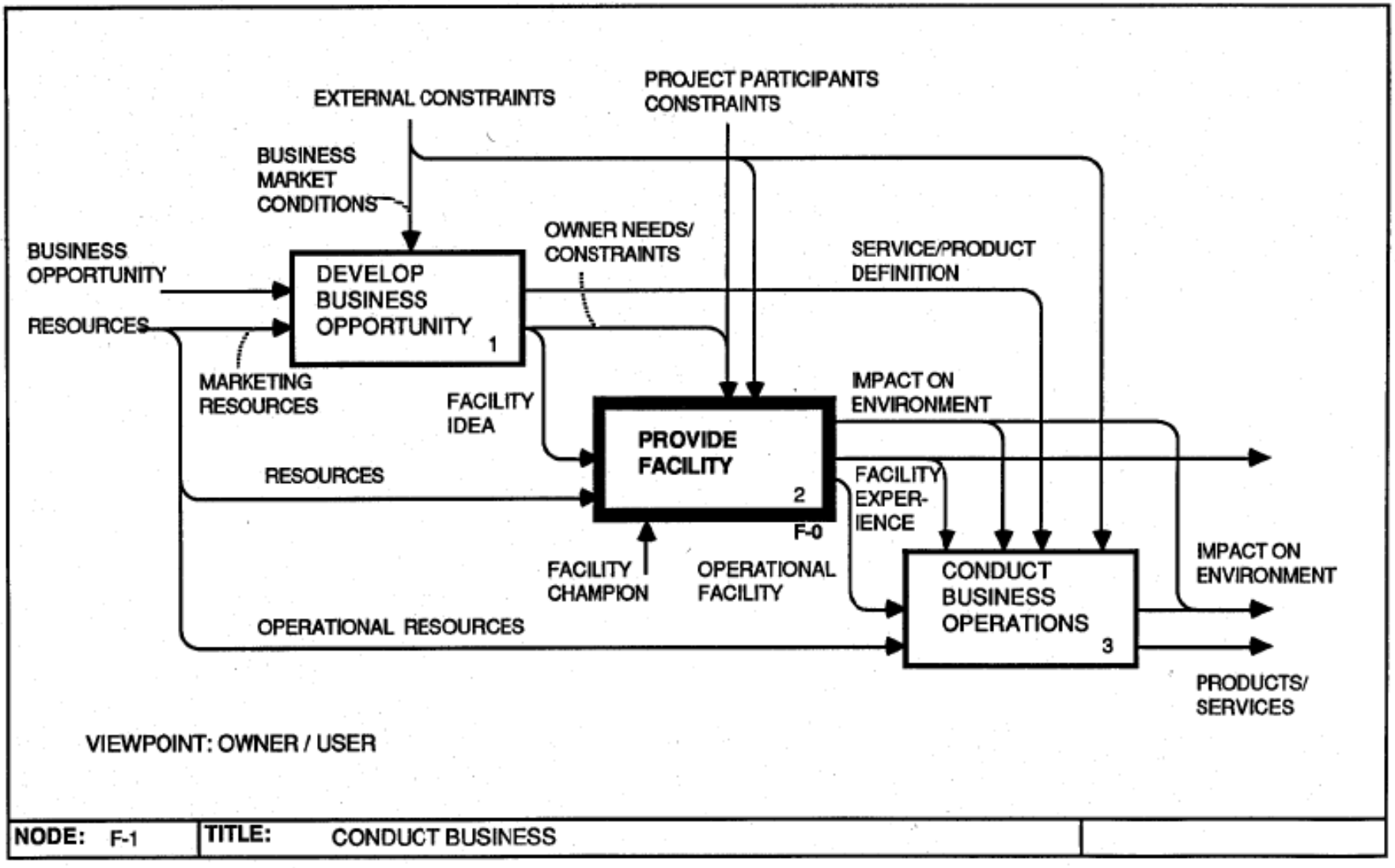
An Integrated Building Process Model (IBPM)

- **Objective:** Is to develop a model of the essential functions required to provide a facility to the end user.
- **Functions:** Managing, planning, design, construction and operations of a facility.
- **Modeling methodology to represent these processes**: IDEF 0 was selected as the most appropriate modeling tool.

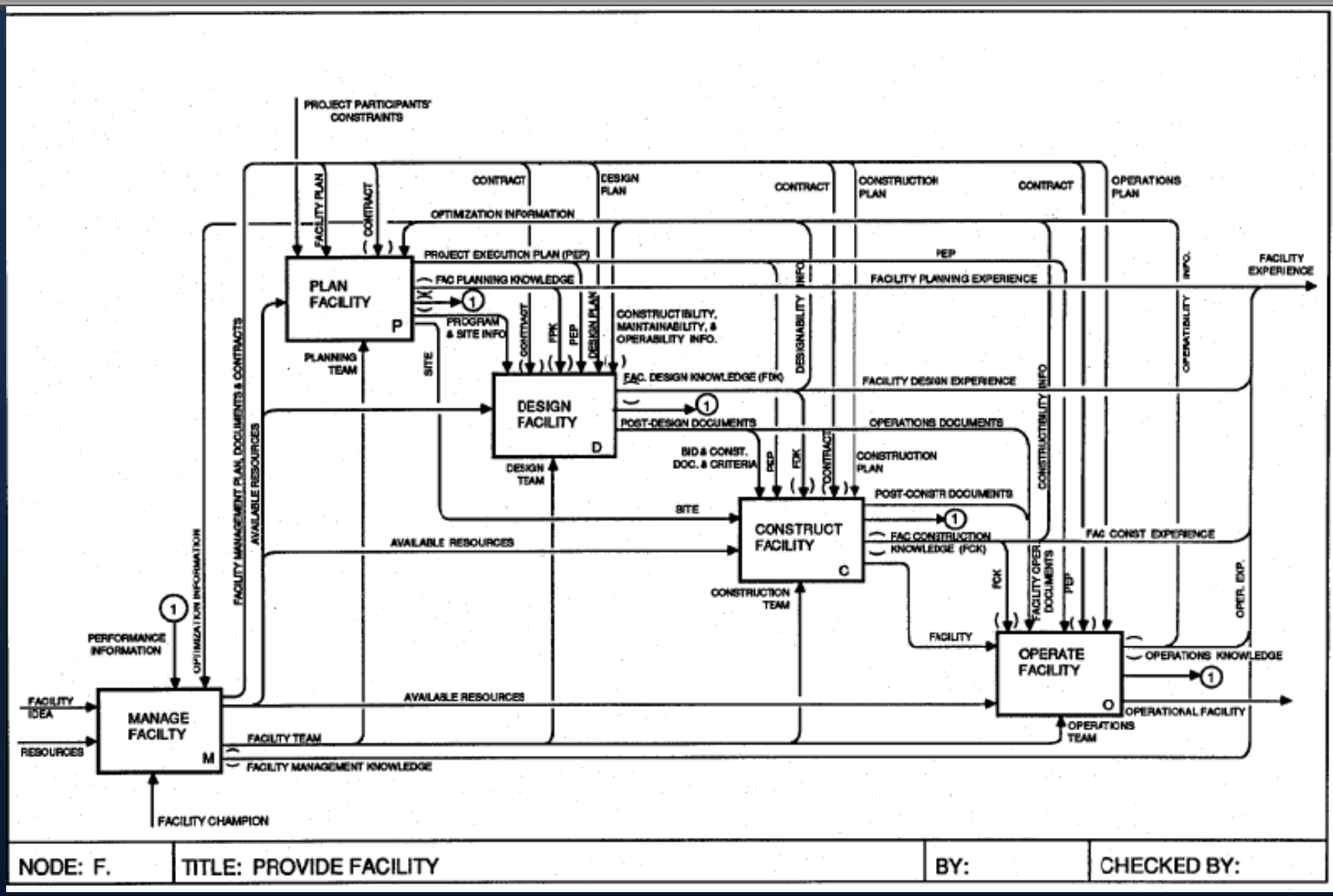


Schematic representation of the Function Box

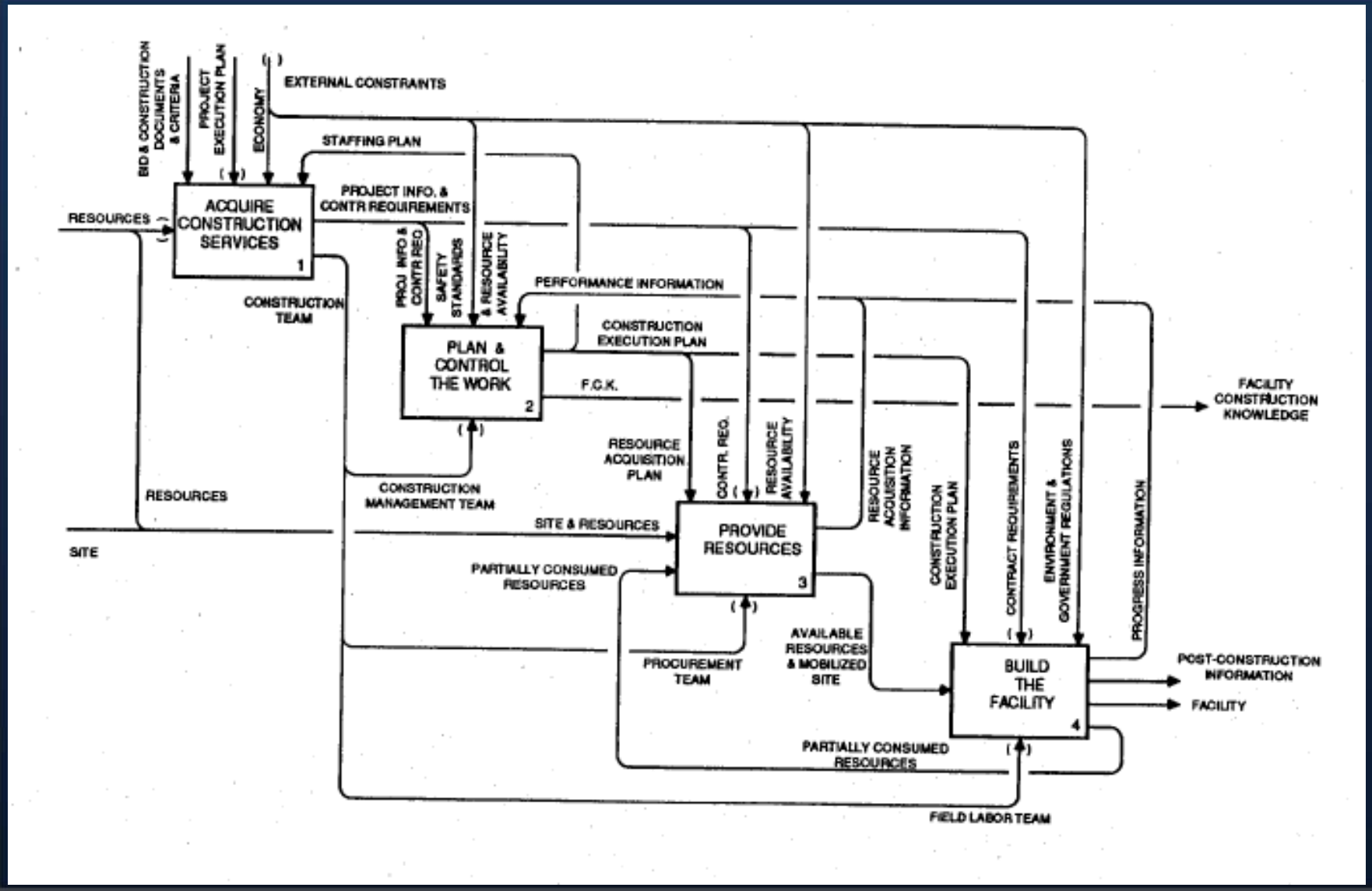
Conduct Business



Provide Facility



Construct Facility

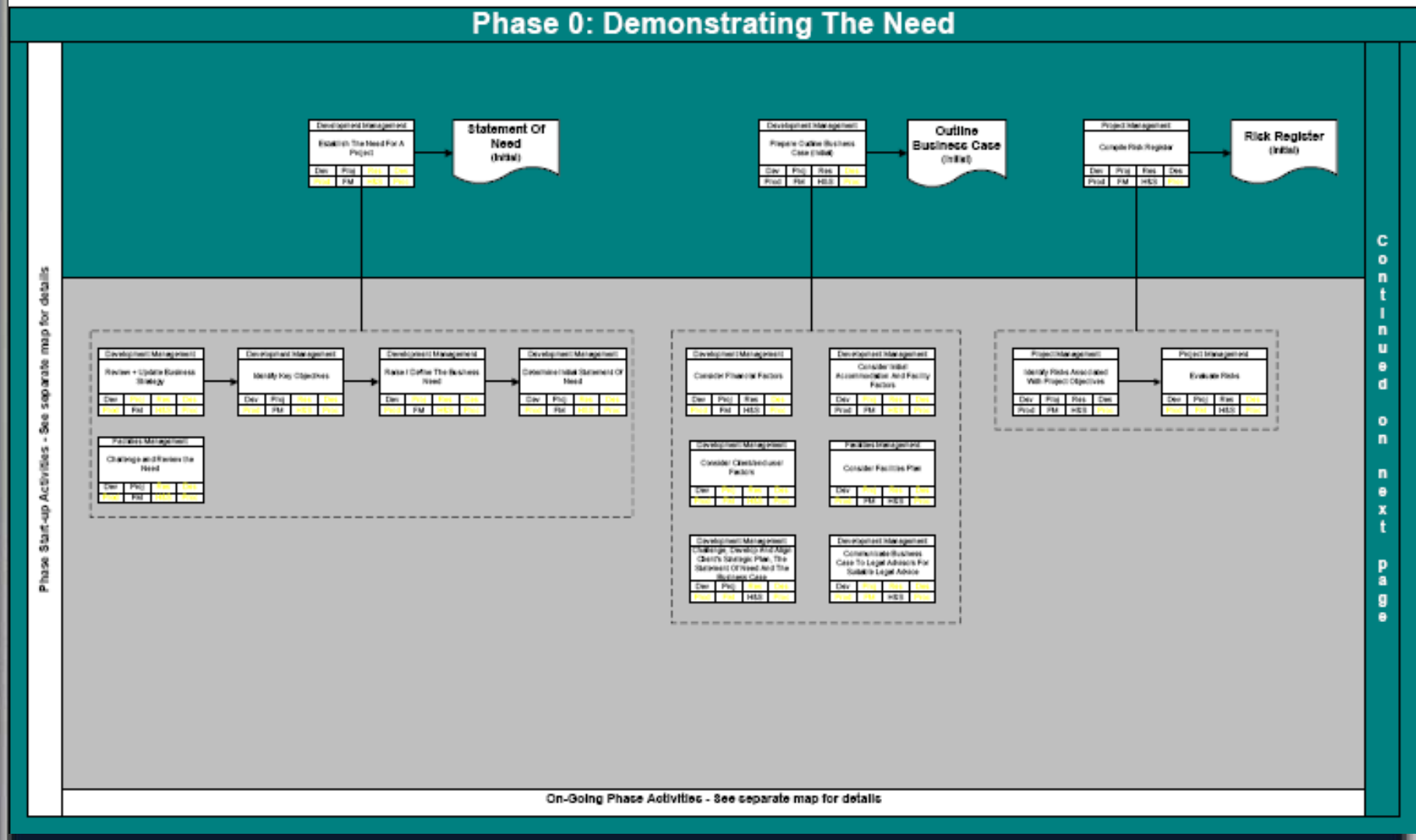


Process Protocol

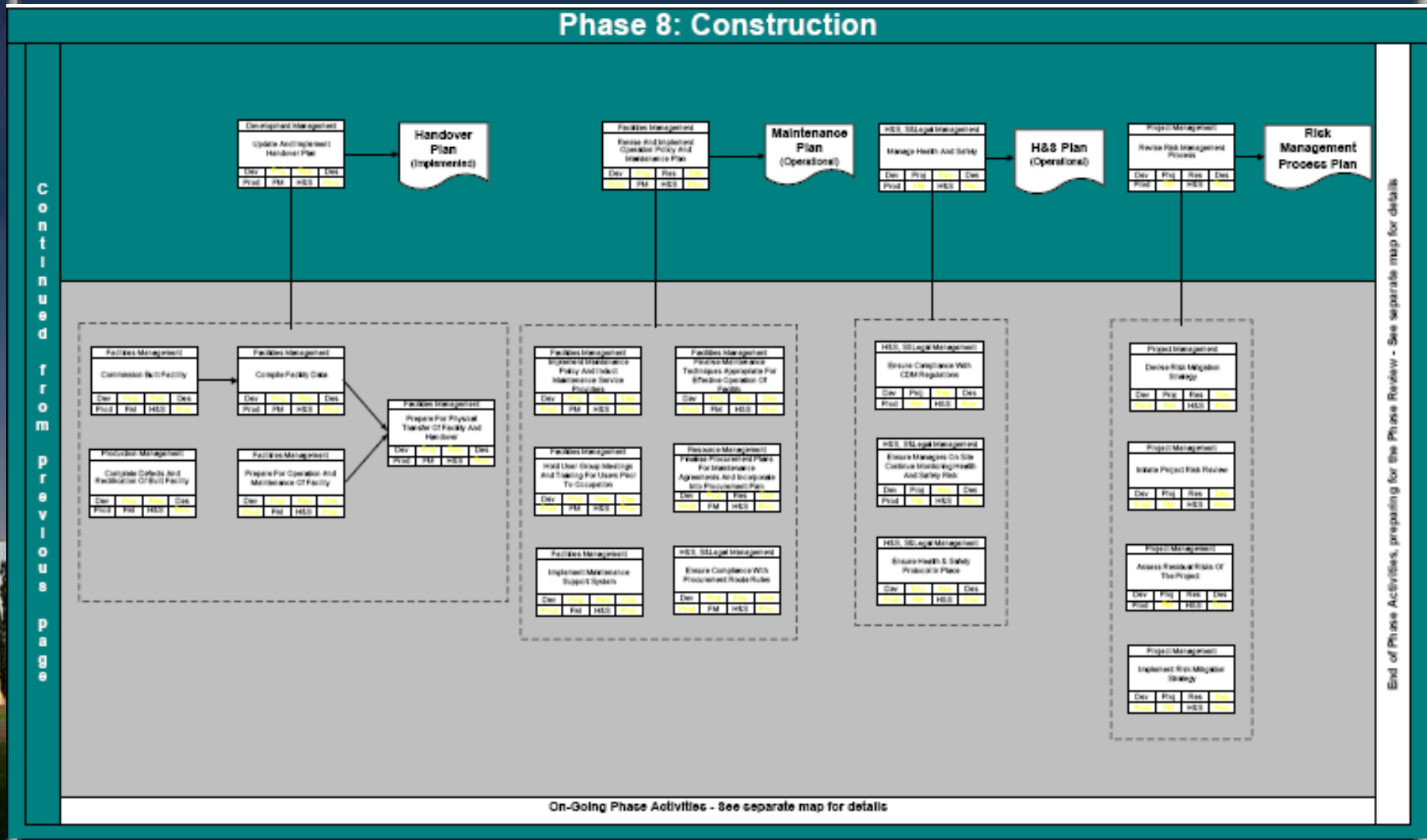
- The process protocol map illustrates the design and construction process in terms of the various phases of the development, the main participants enacting the process, the deliverables of the process and the way in which the process is managed through the phase review process.

- **Phases:** There are 10 phases covering aspects of a project lifecycle from the demonstration and conception of need to the operation and maintenance of the constructed and/or refurbished facilities. Issues of decommissioning and demolition are considered at the front end of the process.

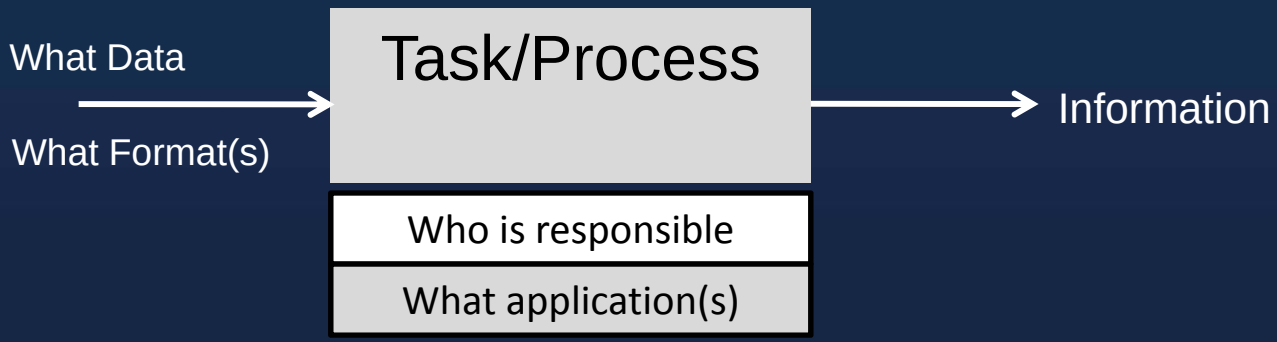
Phase 0: Demonstrating the need



Phase 8: Construction

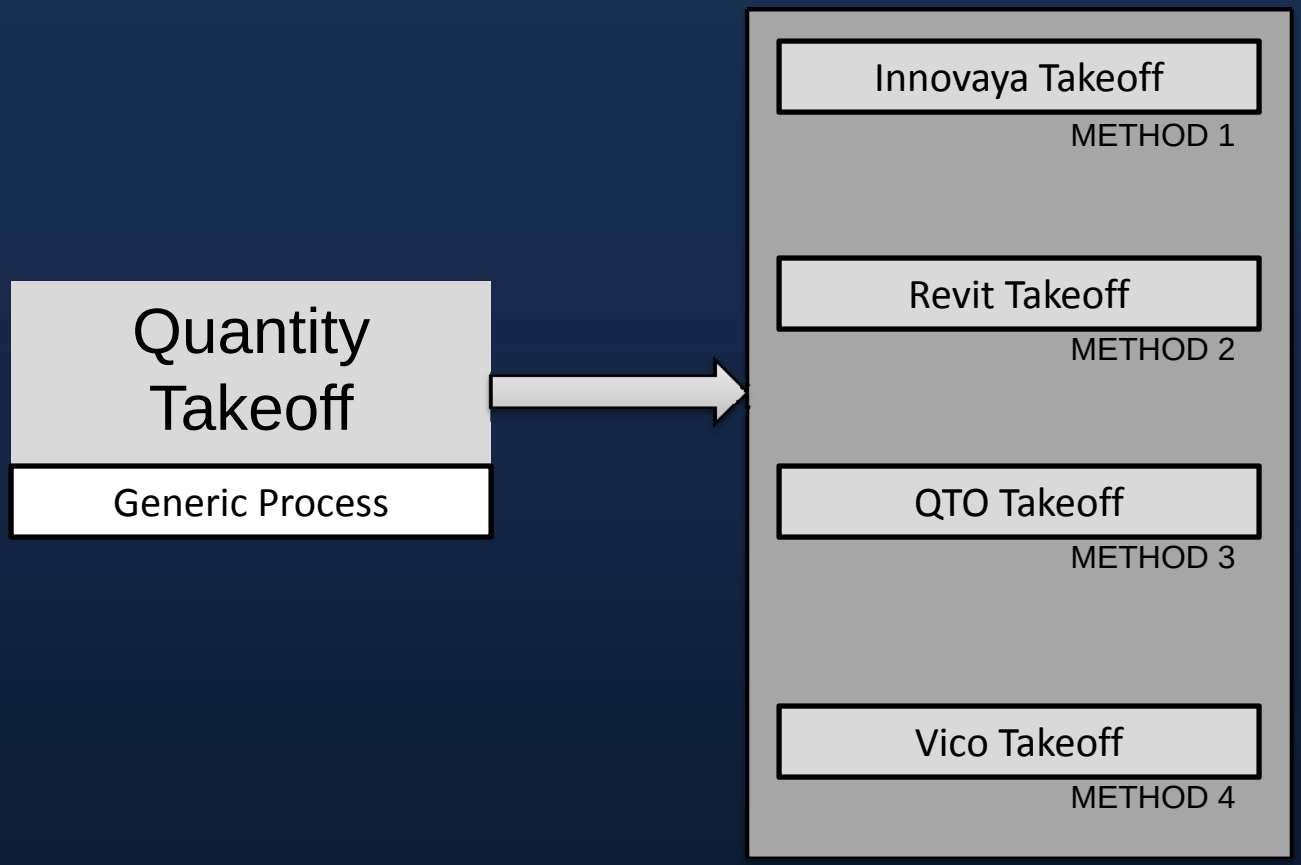


Planning Information Requirements

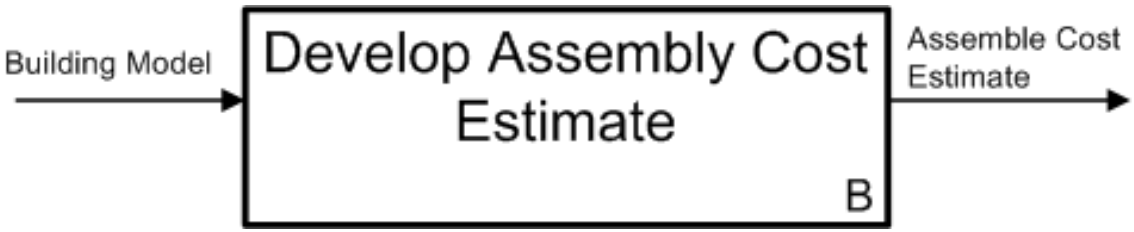


Process Planning Concept

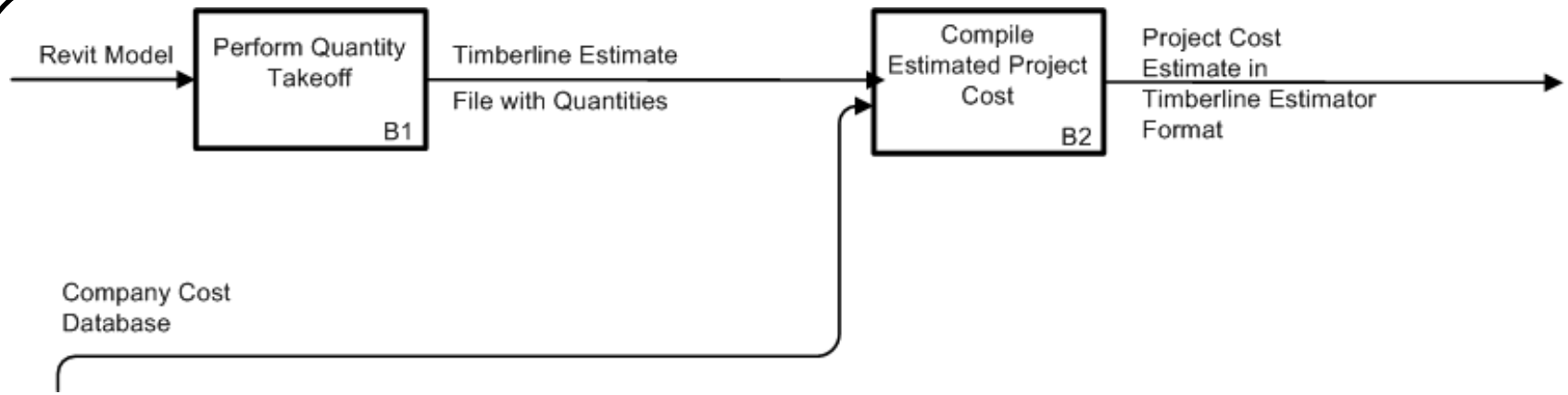
From Generic To Specific



BIM Use Example: Generic Process Model

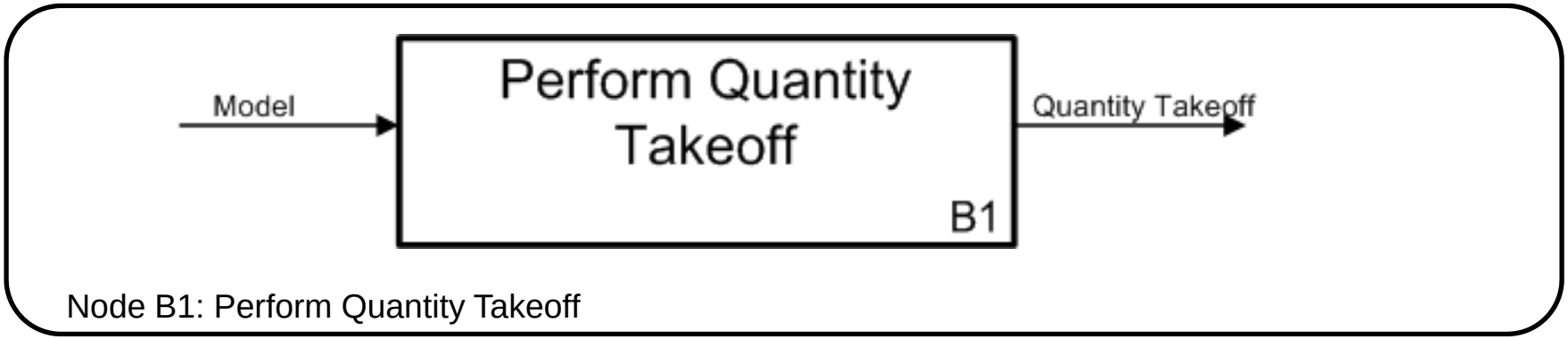


Node B: Develop Assembly Cost Estimate



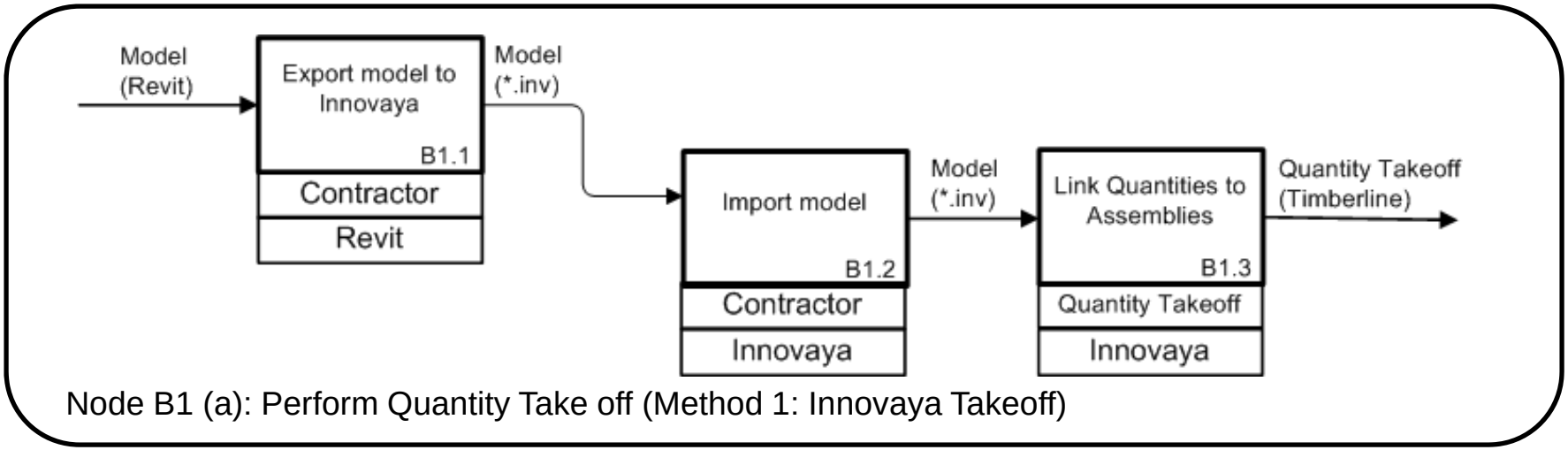
Node B: Develop Assembly Cost Estimate

BIM Use Example: Project Execution Plan

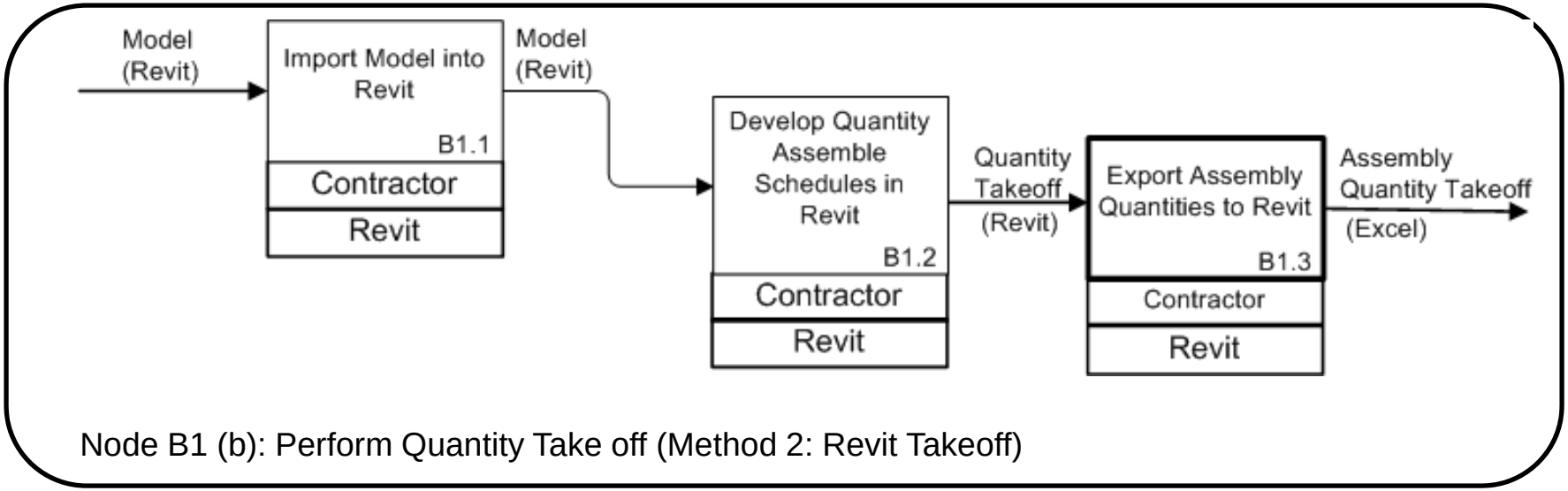


Node B1: Perform Quantity Takeoff

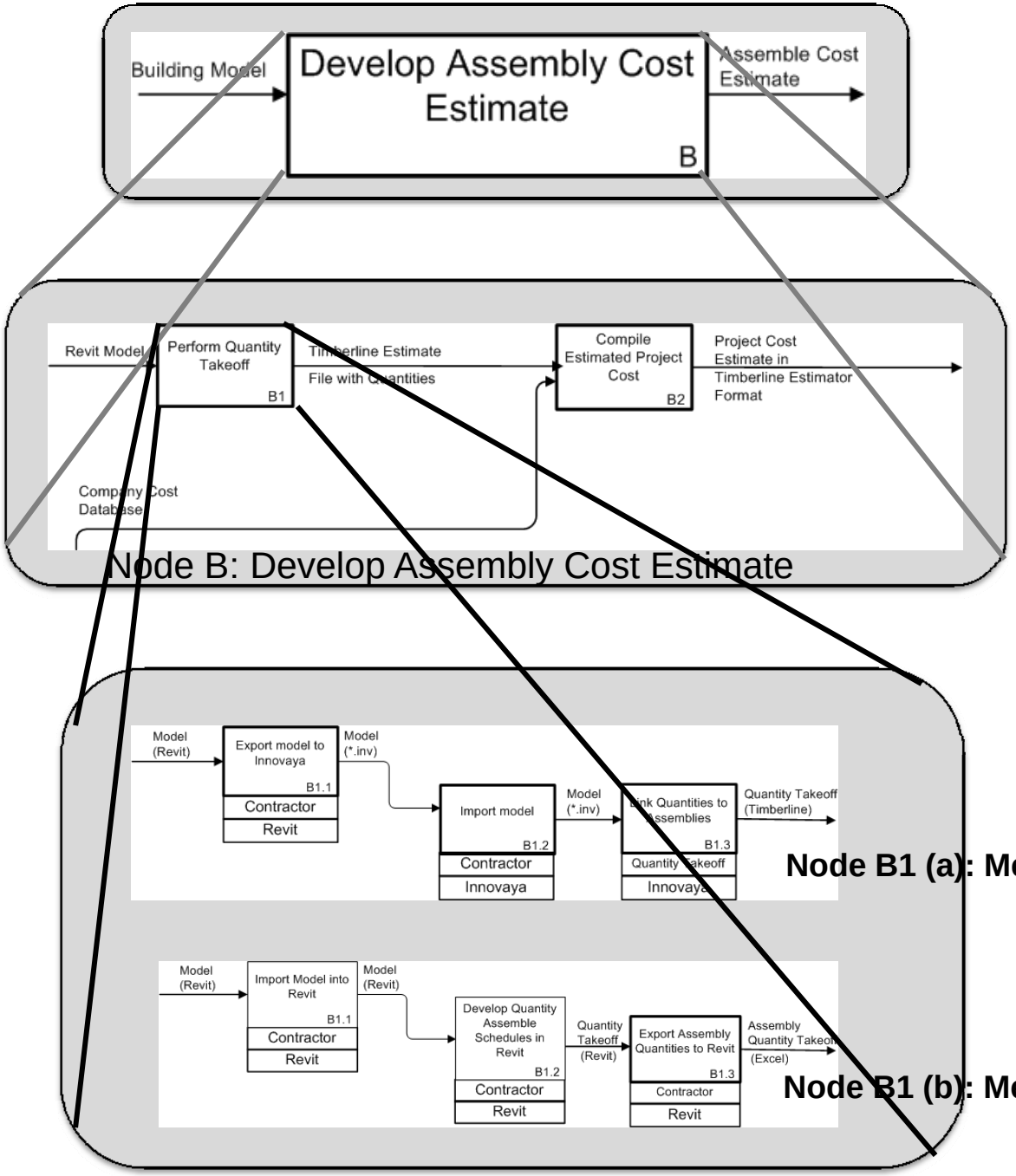
BIM Use Example: Project Execution Plan



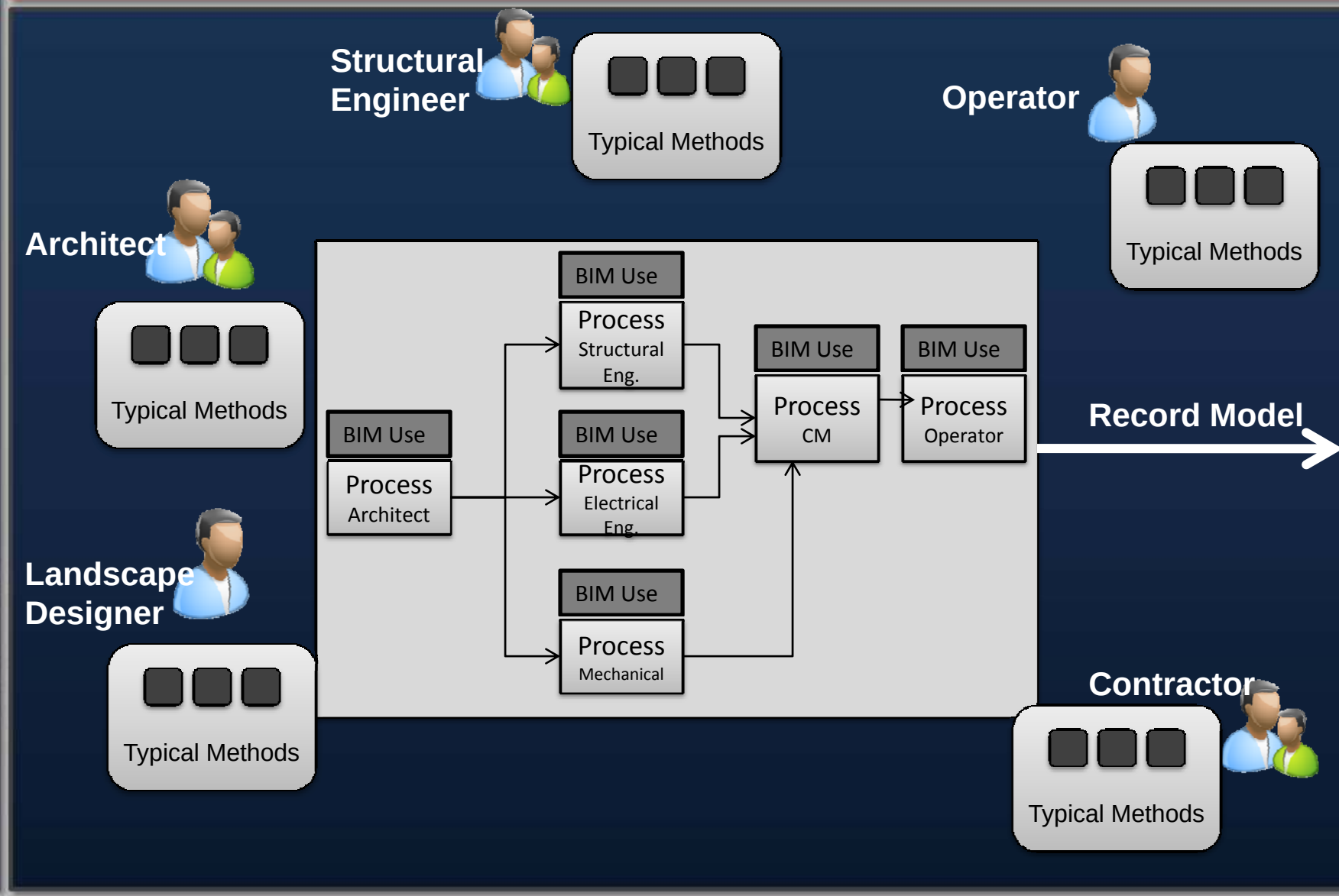
Node B1 (a): Perform Quantity Take off (Method 1: Innovaya Takeoff)



Node B1 (b): Perform Quantity Take off (Method 2: Revit Takeoff)


Building Model
Develop Assembly Cost Estimate
B
Assemble Cost Estimate
Revit Model
Perform Quantity Takeoff
B1
Timberline Estimate
File with Quantities
Compile Estimated Project Cost
B2
Project Cost Estimate in Timberline Estimator Format
Company Cost Database
Node B: Develop Assembly Cost Estimate
Model (Revit)
Export model to Innovaya
B1.1
Contractor
Revit
Model (*.inv)
Import model
B1.2
Contractor
Innovaya
Model (*.inv)
Link Quantities to Assemblies
B1.3
Quantity Takeoff
Innovaya
Quantity Takeoff (Timberline)
Node B1 (a): Method 1
Model (Revit)
Import Model into Revit
B1.1
Contractor
Revit
Model (Revit)
Develop Quantity Assemble Schedules in Revit
B1.2
Contractor
Revit
Quantity Takeoff (Revit)
Export Assembly Quantities to Revit
B1.3
Contractor
Revit
Assembly Quantity Takeoff (Excel)
Node B1 (b): Method 2

BIM Project Execution Planning Process



Three Month Look Ahead

- Develop detailed execution planning process method example
- Complete BIM Use definitions, and example process template for the BIM Uses
- Complete the draft list of content for the BIM Execution Plan

Thank You

Next Meeting Time?